**BIRLA INSTITUTRE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS**

**SECOND SEMESTER 2019-2020**

**COURSE HANDOUT**

**Date: 06.1.2020**

**Course No**. **: PHY F241**

# Course Title : Electromagnetic Theory II

**Instructor-in-charge** **: SOURI BANERJEE**

**Instructor**  **: Souri Banerjee**

**1. Course Description:** The course covers the following main topics: Electrostatics, Magnetostatics, Conservation Laws, Electromagnetic Waves, Potentials and Fields, Radiation, Electrodynamics and Relativity and, Scattering.

**2. Scope and objective:** Classical electromagnetic theory along with Classical mechanics and Quantum mechanics form the foundation of theoretical physics. Working knowledge of electromagnetic theory (EMT) is a must to be a good physicist. Knowledge of EMT will also be beneficial for engineers too. The present course lays the conceptual foundation of the theory.

**3.** **Text Book:** David Griffiths, J., *Introduction to Electrodynamics*, PHI, 3rd ed. 1999.

**4. Reference Book: R1:** Reitz & Millford, *Foundations of Electromagnetic Theory*,

Narosa Pub. House, 3rd 1997; **R2**: J. D. Jackson, *Classical Electrodynamics*, Wiley, 3rd 1999.

**5. Course Plan:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture Number** | Learning Objectives | Topics to be Covered | **Chapter in the Text Book** |
| **1-3** | Review of Magnetostatics | Underlying symmetry of electrostatics and magnetostatics, Magnetic Vector potential, Multipole expansion of vector potential | 5 |
| **4-7** | Magnetic fields in Matter (Self-study 50%) | Magnetization, the field of a magnetized object, Ampere’s law in magnetized materials, Magnetic susceptibility and permeability, Ferromagnetism | 6 |
| **7-9** | Maxwell’s equations (Self-study 50%) | Maxwell’s equations in space, in matter, boundary conditions of electric and magnetic fields | 7.3 |
| **10-15** | Conservation laws | Conservation of Charge, Energy momentum, Poynting theorem, Maxwell stress Tensor | 8.1, 8.2 |
| **16-24** | Electromagnetic Waves | Electromagnetic waves in dielectric matter, reflection, refraction and transmission at interfaces, Wave propagation in metals, Absorption & Dispersion, Guided waves. | 9.2,9.3,9.4,9.5 |
| **25-33** | Potentials and Fields | The Potential formulation, Retarded potentials, Lienard-Wiechert potential and fields of a moving point charge | 10.1,10.2,10.3 |
| **34-40** | Electromagnetic Radiation | Electric Dipole Radiation, Radiation from Point Charge, Abraham-Lorentz formula | 11.1,11.2 |

**6. Evaluation Scheme:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EC No.** | Evaluation Component | Duration | **Weightage (%)** | **Date, Time** | **Nature of Component** |
| 1. | Midsem | 90 mnts | 30 | 4/3 1.30 -3.00 PM | Closed Book |
| 2. | Comprehensive exam | 3 hr | 40 | 08/05 FN | Close Book |
| 3. | a.) Quiz (best 2 out of 3)  b) Seminar | 20 mins | 30 |  | Open Book |

**7. Chamber Consultation Hour:** Any time when I am not teaching

**8. Notices:** Notices for the course will be displayed on the Physics Dept notice board & CMS

**9. Make-up Policy:**  Make up will be given only in cases of genuine sickness or unavoidable need to go out of the campus. Make up requests (hard copy) must be given at least one day before the test.

**10.Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor-in-charge**

### PHY F241